# Novra S200/S200CA Receiver
# User Manual

**Subject to change without notification**

**CAUTION: Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.**

# Novra S200/S200CA
# DVB-S2 Satellite Data Receiver
# User Manual

## Subject to change without notification

Document version: 1.01

**Important-** Please read this entire manual before installing or operating this product.

**Disclaimer**

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# 1 Conventions

## 1.1 Text Conventions

**NOTE**: Information in this box will be Informative.

**CAUTION: This information will be quite important and should not be ignored.**

- Text appearing in `Courier` font indicates characters to be typed in; e.g. type `Shell` indicates that the word "Shell" must be entered exactly as it appears, with the first letter capitalized.
- Text appearing in Bookman Old Style font indicates a directory path or filename; e.g. c:\Program Files.
- Text appearing in SMALL CAPS and CopperPlateGothic32bc font in an instruction indicates a button that must be clicked, or a key that must be pressed, or a field that must be entered or a particular screen; e.g. BUTTON indicates a button that must be clicked.

## 1.2 Applicable Models

This manual is applicable to the following S200 Models:

- Novra S200 – DVB-S2/DVB-S satellite data receiver capable of receiving IP data,
- Novra S200-Pro – Same functionality as the S200, but with the added capability to receive MPEG Video data, and
- Novra S200CA – Same functionality as the S200-Pro, but with a conditional access Common Interface (CI) slot, making it compatible with many commercially available conditional access encryption systems.

## 1.3 Model Naming Convention

This manual uses the S200 naming convention when referring to any one of the applicable S200 models (see Section 1.2 above).

**NOTE:** - This manual covers all of the models listed in Section 1.2 above. The S200 Console will automatically detect the receiver model and will gray out console tabs that are not required to configure the receiver.

If the feature you are trying to configure is grayed out in the S200 Console, please contact Novra Support (www.novra.com) to inquire about a firmware or hardware upgrade.

# 2 Introduction

## *2.1 Principles of Operation*

The S200 is a satellite receiver that enables the reception of IP and Video data carried on a DVB-S2 or DVB-S compliant satellite signal.

Please refer to Figure 1 below for a better understanding of the S200 operation. The desired DVB-S2 satellite signal is received using an appropriately sized satellite dish (not covered in this manual). A Low Noise Block (LNB) downconverter (not covered in this manual) is used translate the incoming Radio Frequency (RF) signal to an Intermediate Frequency (IF) signal. The S200 receives this I/F signal and extracts the IP or MEG content, which is then passed onto the S200 LAN for distribution or viewing via computers connected to the LAN. The received data type may be IP data or may be MPEG video data, depending on the S200 model being employed.

The S200 Management Console resides on a PC connected to the S200 via an Ethernet crossover cable or through an Ethernet hub. The Console is used to perform the following functions:

- Configure IP address network parameters,
- Specify satellite tuning parameters,
- Specify decryption parameters,
- Select DVB information streams by Program IDentification number (PID), and
- Map audio/video PIDs to multicast address(es).

Once configured, the S200 will retain its settings and continue to forward data transmitted to you by your service provider even after restarting the S200 or your PC.

The S200 Receiver does not require a computer to continue operation. Once the configuration has been set, you should have no need to change them.

# 3 Getting Started

## *3.1 Typical S200 Installation*

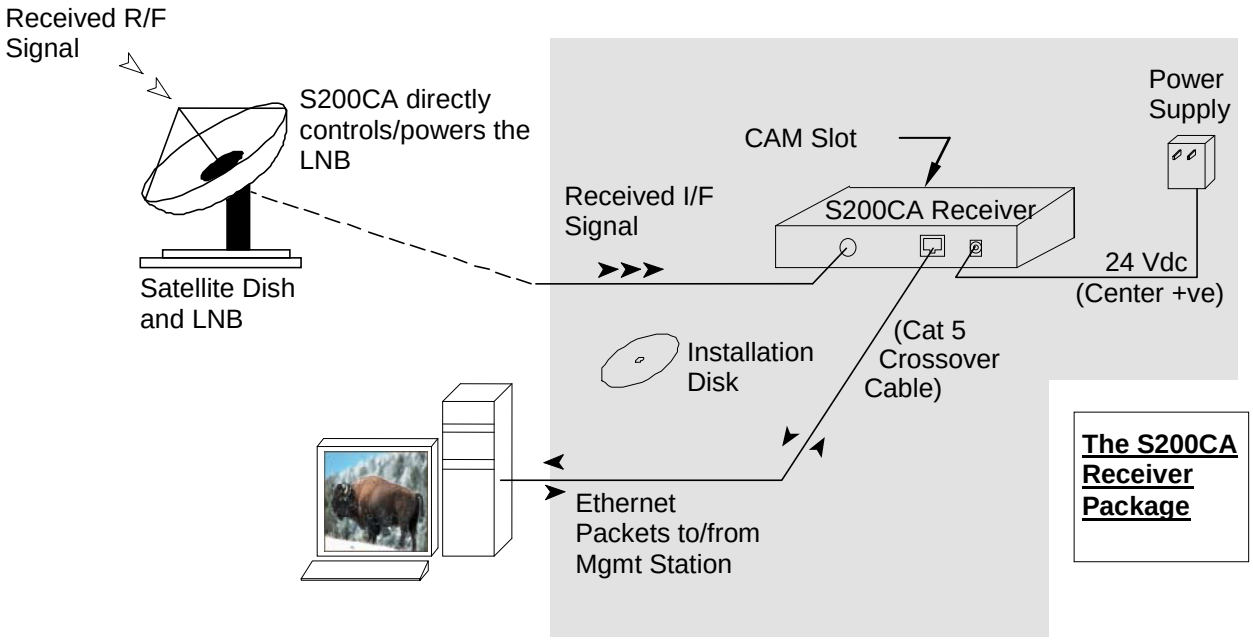



**Figure 1: Typical Configuration**

**NOTE:** - This information is needed in order for the receiver to function. It is recommended that all the information be collected before attempting to install the service. Novra Technologies Inc. expects that end users, who wish to control the LNB with the receiver, already have good understanding of satellite technology.

**CAUTION:** Nothing should be inserted between the S200 and the satellite dish except for a surge suppressor. Cable TV Splitters, TVs, VCRs, and FM receivers are not designed for connection to this portion of the network. It is very likely they will be damaged by the LNB DC voltage generated by the S200

**NOTE:** - Prior to removal of the smart card while running a live stream, it is recommended that the S200CA be powered down for 10 seconds, or that the Conditional Access Module (CAM) is first removed from the S200CA. To re-insert the smart card while running a live stream, it is recommended that the smart card be first inserted into the CAM and then the CAM be inserted into the S200CA.

## 3.2 What Information do I Need – Basic Configuration?

Before using the S200 configuration software to configure your receiver, you need to gather the following information:

1) The LO Frequency _____ in MHz of the stream you wish to receive.

**NOTE:** Local Oscillator Frequency is specific to the LNB Model and is usually stamped on the Unit or can be found in the LNB Manual. Typical values include: 9.75, 10.60, 10.75, 11.00, and 11.25 GHz for the Ku band. And for the C Band satellite frequencies a typical value is 5.15 GHz.

2) The RF Band Frequency _____ in MHz of the stream you wish to receive. Your satellite service provider should be able to provide this information for you.

3) Polarization: Horizontal / Left ____(+15, 18 or 20 Volts DC) **OR** Vertical / Right____(+11, +13, or 20 Volts DC). Your satellite service provider should be able to provide this information for you.

**NOTE:** If the LNB does not have the ability to switch polarizations, choose a value that will provide the most suitable power supply voltage. In most cases this will be Horizontal / Left (+18 Volts).

4) Will the receiver be controlling a Single Band LNB (Most Common) or a Universal Band / Dual LNB?

**NOTE:** The 22 KHz (or 44 KHz) tone is used to switch between the 2 bands of the LNB. The receiver should be configured so that the proper tone is used and the proper band is selected.

5) The Symbol Rate in Msps. _____

Examples: 21.096, 5.12600, 1.00, …etc.

6) The IP Address to be assigned to your Novra S200 Receiver

Example: 192.168.170.125

7) The IP address of the Default Gateway for the receiver.

8) Is the receiver supposed to filter multicast traffic using IGMP?

**NOTE:** IGMP is an Internet standard that is used to control multicast traffic on the LAN based on the client's interest in the stream. For proper operation, all components of your network should support IGMP

## 3.3 SOFTWARE Installation on Windows 2000, XP, or Vista

The S200 Console software is supplied as a single executable. Therefore, it is easy to install on different systems. All you need to do is copy the executable to your working directory.

**NOTE:** - You MUST be logged onto the system as Administrator.
**NOTE:** - Your screen resolution **MUST** be at least 800 x 600 and at least "**16 bit color**" to function properly.

## 3.4 S200 Startup and Main Screen

1- Start the S200 Console software.

**NOTE:** - You MUST be logged onto the system as Administrator, for the network settings function to work properly.

2- The software will attempt to auto-detect all the receivers currently connected to the LAN.

3- The first step in configuring your S200 is to ensure the network settings of the device make it accessible from the Windows management PC. The IP address of the device and the IP address of the management station must reside on the same subnet, or there must be a route that connects both of them through a router. If this is NOT the case, you will be prompted with the Change IP Address Screen as shown below in Figure 2. You will need to change the IP address of your management PC to be on the same subnet as the receiver (in this case, change your PC IP address to: 192.168.0.xxx, where xxx is not equal to 136)

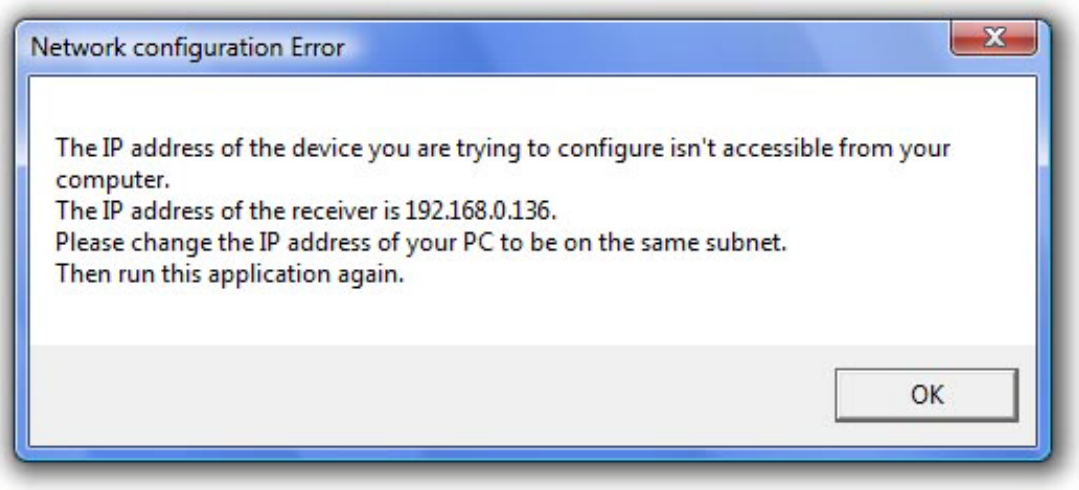

Network configuration Error
The IP address of the device you are trying to configure isn't accessible from your computer.
The IP address of the receiver is 192.168.0.136.
Please change the IP address of your PC to be on the same subnet.
Then run this application again.
OK

**Figure 2 – Change IP Address Screen**

4- If more than one receiver is found on the LAN you will be prompted to select one of them. Check the MAC address to make sure you are connecting to the desired receiver.

5- Once you have selected your receiver, you will be prompted for a password. The default password that you can use with your new receiver is: `Novra-S2.`

**Figure 3 – S200 Login Password Screen**

**NOTE:** - Default Password is `Novra-S2`

6- After successfully entering the password, you will be presented with the S200 Consol main screen (as shown below).

### 3.4.1 S200 Main Screen – DVB-S2

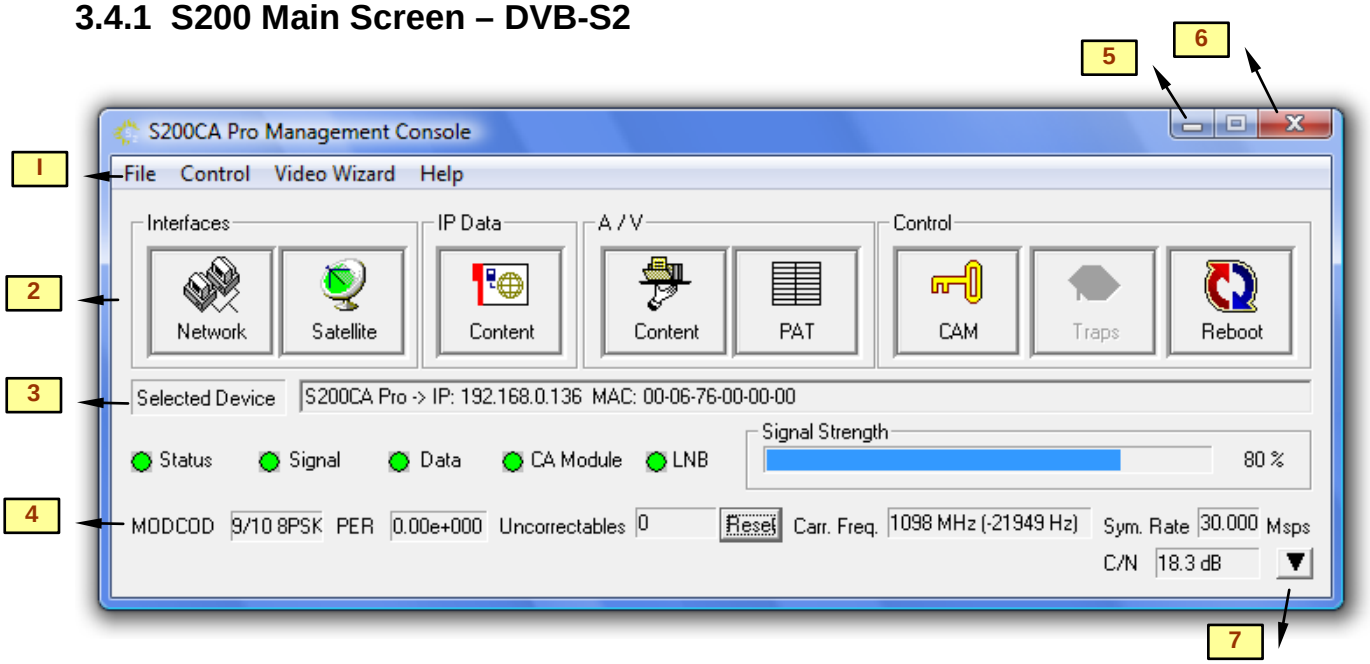



**Figure 4 - S200 Console Main Screen for DVB-S2 Operation**

The figure above shows a typical screen setting when the S200 is operating in DVB-S2 mode. The screen provides configuration tabs as well as status information on the S200 operation. At a glance, we can determine a great deal about the status of the S200 operation, including:

- The console is receiving status from the S200 (status LED),
- The receiver is locked (Signal LED) to a 30 Msps signal with a C/N of 18.3 dB.
- The LNB DC voltage is turned on (LNB LED),
- A CAM is installed and receiving valid encrypted streams (CAM LED)
- The S200 is receiving and processing valid DVB data (Data LED)
- The signal strength is good at 80%
- The S200 is demodulating a DVB-S2 signal with a modulation rate of 8PSK and a coding rate of 9/10
- The received signal quality is good, with no uncorrectables being counted

The S200 Console can be divided into several basic sections. Each of these sections is described in detail below:

1. At the top of the S200 Console is a drop down menu that provides access to the File menu items, the S200 Configuration menu items, a Video Wizard and the Help screen.
2. Below this, are the tabbed buttons that also provide access to the various configuration menus. The tabbed buttons are also grouped based on functionality. The Interfaces button group (Network and Satellite) enable configuration of the network and satellite interfaces.

The IP Data Content button enables the operator to configure the receiver to receive Multi-Protocol Encapsulation (MPE) data and pass this data onto the LAN. The A/V button group (Content and PAT) provides standard and advanced features enabling the operator to receive MPEG transport stream packets and pass these packets to Multicast IP addresses on the LAN. The last button group, entitled Control, provides additional configuration items that include the CAM, Traps (grayed out) and Reboot.

**NOTE:** - Typically the IP Data function is used to configure the S200 to receive and re-distribute IP data, while the A/V function is used to configure the S200 to receive and re-distribute video programs.

3. The middle bar of this screen displays the IP address and MAC address for the selected S200 being configured.
4. Status information on the operation of the S200 is provided in the lower part of the screen. This status includes:
    i. STATUS – Turns green when the status packets are being successfully received from the S200 by the S200 console.
    ii. SIGNAL – Turns green when the receiver detects an input RF signal at the selected frequency. This matches Signal LED on the front of unit.
    iii. DATA – Turns green when the S200 has achieved data lock. This means that the receiver is able to recover all the digital timing from the input signal and is receiving a valid DVB transport stream. This does NOT match the blue data LED on the front of the S200.

**NOTE:** - S200 DATA LED – The blue data LED on the front face plate of the S200 will blink at a ½ second interval if data is being processed and forwarded by the S200.

CA MODULE – Turns yellow when the S200CA detects a valid CAM in the PC slot. Turns green when the S200CA detects a valid Program Association Table (PAT) on the incoming stream.

    iv. SIGNAL STRENGTH – Provides a graphic indication of the signal power at the input of the receiver. The signal strength is shown as both a bar graph and percentage strength.
    v. MODCOD – Provides the modulation rate and coding rates of the receiver. In the above example, the modulation rate is 8PSK and the coding rate is 9/10
    vi. PER - Provides a count of the Packet Error Rate (PER)

vii. UNCORRECTABLES –. The number of uncorrectable packets that were processed by the demodulator section of the receiver. The counter accumulates and can be reset using the Reset button located beside the Uncorrectables field.

viii. CARR. FREQ. – Provides the I/F carrier frequency in Mhz and the difference between the desired IF frequency and the tuned value.

ix. SYM. RATE – Provides the receiver symbol rate.

x. C/N – Provides the receive signal Carrier-to-Noise ratio (C/N).

5. **Minimize** – To the system Tray
6. **Close** – Close the S200 Console
7. **More Status** – This down arrow will expand the bottom of the screen to show further status information on the S200 traffic. This expanded screen is shown in Figure 5 below.

i. TOTAL ETHERNET PACKETS SENT: This counter accumulates the total number of packets being sent from the Ethernet port on the receiver.

ii. TOTAL ETHERNET PACKETS RECEIVED: The number of Ethernet packets that the S200 received on the Ethernet interface.

iii. ETHERNET RECEIVE ERRORS: The number of errors that occurred during the reception of Ethernet packets.

iv. ETHERNET PACKETS DROPPED: the number of packets that the S200 couldn't transmit due to lack of buffers, or irresolvable address.

v. DVB PACKETS ACCEPTED: The number of DVB packets that the receiver accepted and processed.

vi. DVB PACKETS DESCRAMBLED: The number of clear or descrambled DVB packets that the receiver accepted.

vii. DVB PACKETS NOT DESCRAMBLED: The number of scrambled DVB packets that the receiver accepted.

viii. DVB PACKETS WITH BAD SYNC: Number of packets that didn't have a proper synchronization byte.

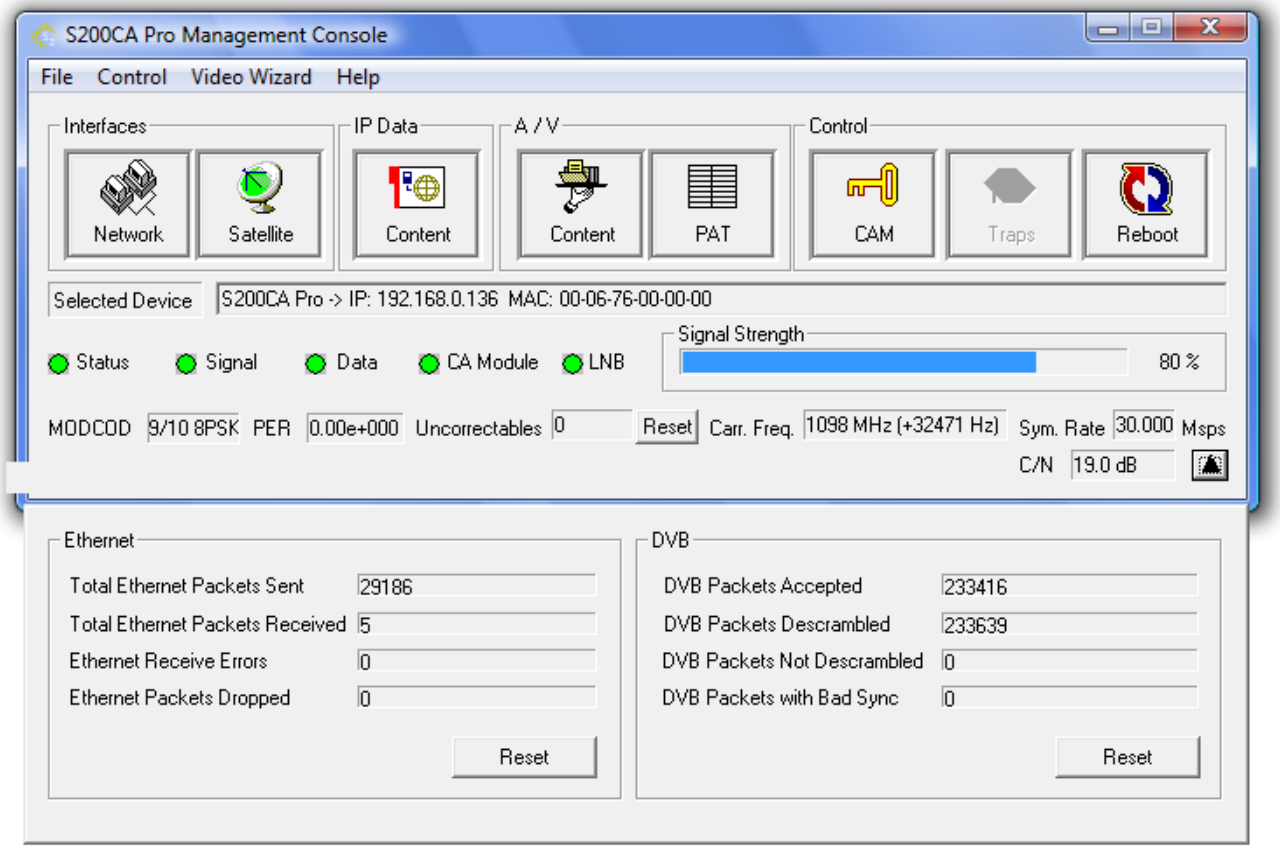



**Figure 5 – S200 Console Main Screen with Stats Window**

**NOTE:** The counters will keep accumulating as long as the window is open. You can use the reset buttons to reset the counters

### 3.4.2 S200 Main Screen – DVB-S

The S200 supports both DVB-S2 and DVB-S modes of operation. If the DVB-S mode is selected (to select - see the Satellite Button section below) the S200 main screen is automatically modified to change/remove the DVB-S2 modulation parameters to those that are supported in DVB-S. This is illustrated in Figure 6 below.

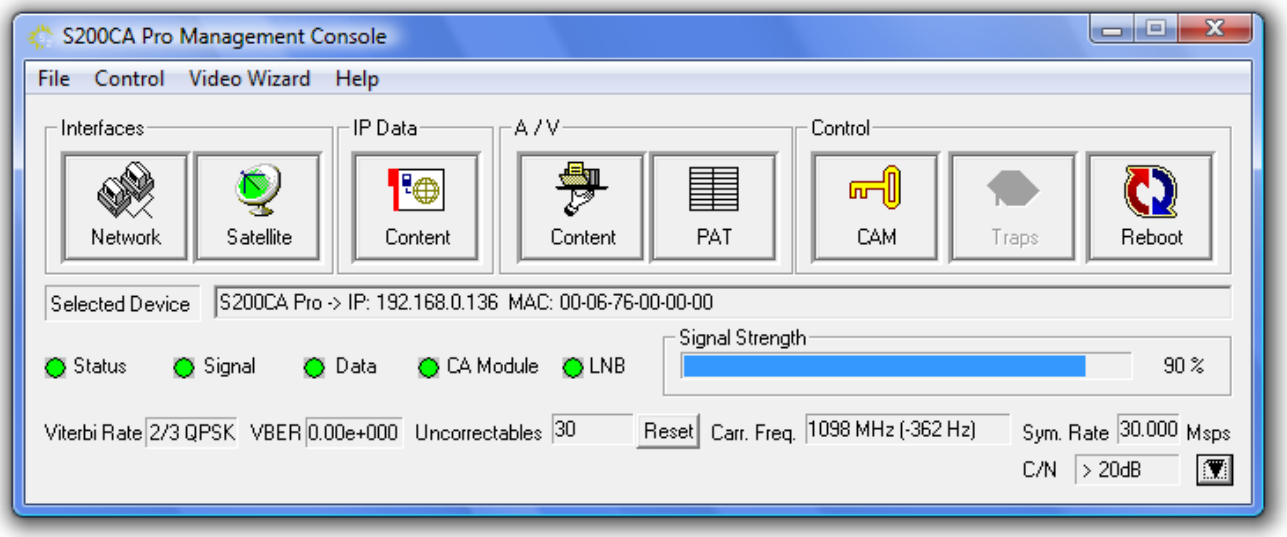



**Figure 6 - S200 Console Main Screen for DVB-S Operation**

The status parameters are summarized and described below.

1. STATUS – Turns green when the status packets are being successfully received from the S200 by the S200 console.
2. SIGNAL – Turns green when the receiver detects an input RF signal at the selected frequency. This matches Signal LED on the front of unit.
3. DATA – Turns green when the S200 has achieved data lock. This means that the receiver is able to recover all the digital timing from the input signal and is receiving a valid DVB transport stream. This does NOT match the blue data LED on the front of the S200.

> **NOTE:** - S200 DATA LED – The blue data LED on the front face plate of the S200 will blink at a ½ second interval if data is being processed and forwarded by the S200.

4. CA MODULE – Turns yellow when the S200CA detects a valid CAM in the Common Interface (CI) slot. Turns green when the S200CA detects a valid Program Association Table (PAT) on the incoming stream.
5. SIGNAL STRENGTH – Provides a graphic indication of the signal power at the input of the receiver. The signal strength is shown as both a bar graph and percentage strength.

6. VITERBI CODE RATE – Indicates the Viterbi code rate of the input stream. This number is only valid when the receiver is locked.
7. VITERBI BER – indicates the receiver Viterbi Bit Error Rate (BER) of the input stream. This number is a true measure of the signal quality.
8. UNCORRECTABLES –. The number of uncorrectable packets that were processed by the demodulator section of the receiver. The counter accumulates and can be reset using the RESET button located beside the UNCORRECTABLES field.
9. CARR. FREQ. – Provides the I/F carrier frequency in Mhz and the difference between the desired IF frequency and the tuned value.
10. SYM. RATE – Provides the receiver symbol rate.
11. C/N – Provides the Carrier-to-Noise ratio (C/N) of the received signal. The C/N is the quotient between the average received modulated carrier power *C* and the average received noise power *N* after the receiver filters.

# 4 Configuring the S200

This chapter discussed how to configure the S200. It covers both the drop down menus as well as the configuration buttons.

> **NOTE:** When editing field lists (such as PID lists), you can often edit or delete the list entries by right clicking on them.
>
> **NOTE:** Pressing Esc on the keyboard when configuring the S200 has the same effect as selecting Exit.

## *4.1 Interfaces*

The Interfaces group of buttons enables the operator to configure the 2 key interfaces on the S200, namely the LAN or Network interface and the satellite or L-Band interface. These are both discussed further below.

### 4.1.1 Network Button

The network settings of the S200 may be modified by selecting the NETWORK Button and changing the appropriate fields (as shown below).

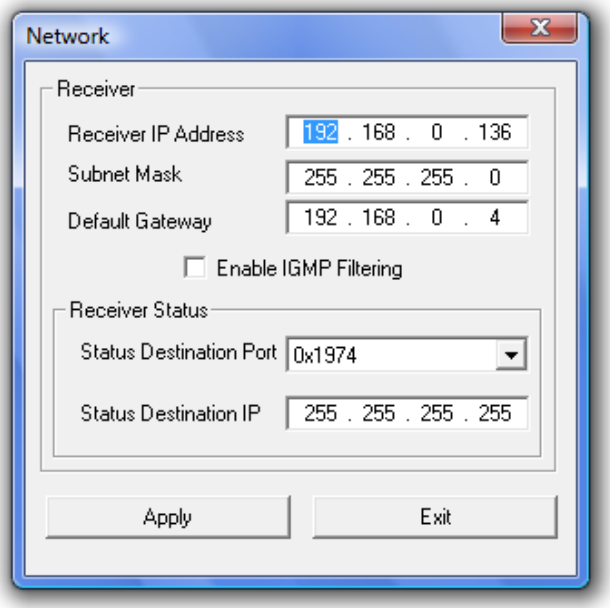



**Figure 7: Network Configuration Dialog Box**

1. RECEIVER IP: This is the IP address to be assigned to the receiver.
2. SUBNET MASK: This is the subnet mask that the receiver should use to determine whether an IP address belongs to the same network or not.
3. DEFAULT GATEWAY: This is the IP address of the router that the receiver should use whenever it wants to send traffic to a non-local address.
4. ENABLE IGMP FILTERING: This check box allows the operator to turn IGMP filtering on or off. IGMP controls which multicast streams will be forwarded on the LAN based on the number of clients listening to that stream.

**NOTE:** - Proper operation of IGMP protocol requires that all devices used in the network support IGMP protocol.

5. STATUS DESTINATION PORT: This is the UDP port used to send a copy of the status packets for remote monitoring applications
6. STATUS DESTINATION IP: This is the IP address used to send a copy of the status packets for remote monitoring applications

**NOTE:** - To turn off the status packets being sent to a unicast destination IP address, set the Status Destination IP to 255.255.255.255.

7. APPLY: By pressing this button, the updates are sent to the receiver
8. EXIT: Exits back to the main screen

**NOTE:** The Device status can be sent to a remote management station by configuring the status destination IP and port. However these settings don't affect the broadcast status messages. To turn off the unicast status, set the destination IP address to 255.255.255.255

### 4.1.2 Satellite Button

The next step in the configuration is to ensure you have the correct RF settings and that the S200 can successfully lock to your satellite signal. To configure your satellite settings, select the SATELLITE CONFIGURATION button and input the following fields:

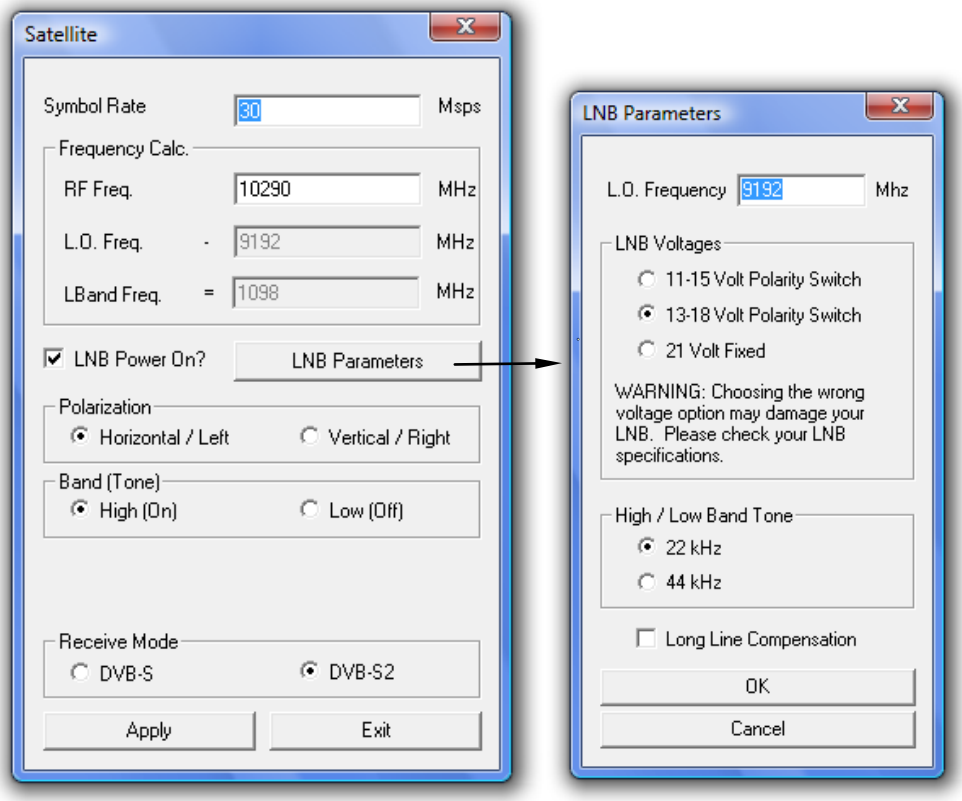



**Figure 8: Satellite Configuration and LNB Parameters Dialog**

1) **Symbol Rate:** This is the symbol rate of the transponder that you are trying to tune to.
2) **Receive Frequency:** The RF Frequency of the signal that you are trying to receive.
3) **LNB Power On:** Turns the DC voltage and tone output of the receiver to ON or OFF.
    a. **Polarization:** Switches the DC output of the receiver between Horizontal/Left and Vertical/Right. This setting is only valid if the LNB power is on.

> **NOTE:** - The LNB voltage level may be set by selecting the LNB Parameters button.

    b. **Band (Tone):** Switch the LNB Tone frequency of the receiver On (High) or Off (Low). This is only valid if the LNB power is on.

> **NOTE:** - The LNB tone frequency may be set by selecting the LNB Parameters button.

4) LNB PARAMETERS: Click this button to bring up the LNB Parameters screen. It is used to set the LO frequency, polarization voltage and LNB tone (see Figure above):
    a. LO FREQUENCY: Input the single-band LO frequency in Mhz.
    b. POLARITY SWITCHING VOLTAGE: Select either 11-15 Volts, 13-18 Volts or 20 Volts for the Vertical/Right and Horizontal/Left LNB voltage values.
    c. HIGH/LOW BAND TONE: Select either 22 KHz or 44 KHz for the LNB switch tone frequency.
    d. LONG LINE COMPENSATION: Checking this box will increase the Polarity Switching voltage by 1 V. This additional voltage may be used to compensate for the voltage drop due to a long I/F cable run between the S200 and the LNB.
    e. OK: By pressing this button, the screen updates will be temporarily stored and the user will be returned to the Satellite screen. By selecting Apply on the Satellite screen the LNB Parameter settings will be sent to the S200. Selecting Exit will exit the Satellite screen without setting the LNB Parameter updates.
    f. CANCEL: Exits back to the satellite dialog screen
5) RECEIVE MODE: Select either the DVB-S2 or DVB-S radio button to set your receiver to receive a DVB-S2 or DVB-S compliant satellite signal.

> **NOTE:** - The S200 will not automatically select between DVB-S2 and DVB-S. The mode of operation must be selected based on the signal type being received.

6) APPLY: By pressing this button, the updates are sent to the receiver.
7) EXIT: Exits back to the main screen

> **NOTE:** - If a dual LNB is being deployed, ensure that the appropriate LO frequency is entered in the LO Frequency box and that the correct band (high or low) is selected in the Satellite screen.

## *4.2 IP Data Content Button*

The IP Data CONTENT button screen (shown below) is to be used when the S200 is to be configured to receive MPE or IP data from the satellite stream and forward this data to the appropriate IP address on the LAN. This screen is used to add (or delete) the data Program IDs (PIDs) that enable the S200 to receive the IP content.

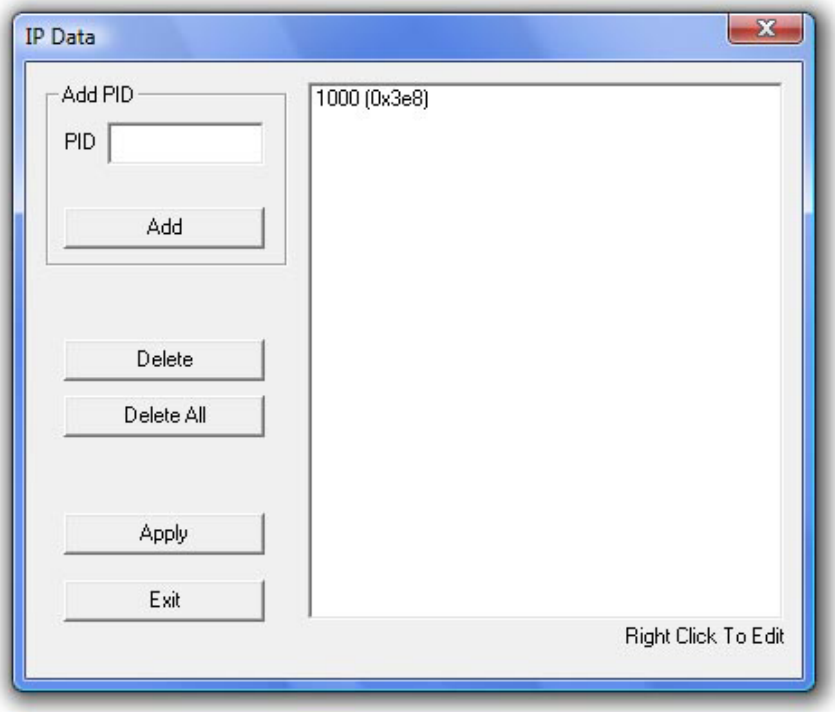



**Figure 9: IP Data Content PID's**

1. PID: Use this edit box to add a new Program ID to the list; you can use decimal input or hexadecimal values preceded by "0x".
2. ADD: This button adds the content of the PID box to the PID List.
3. DELETE: This button deletes the selected PID from the PID list.
4. DELETE ALL: This button will empty the PID list.
5. APPLY: By pressing this button, the list will be sent to the receiver.
6. EXIT: Exits back to the main screen

**NOTE:** - The keyboard may be used to add and remove PIDs. Also, to edit or delete the PID list, right click on the list entry

## *4.3 A/V*

The A/V button group is only available on the S200-Pro model and enables the operator to receive MPEG audio/video data by adding selected MPEG PIDs to the received PID program list. You will also be able to generate a new Program Association Table (PAT) for each received program (refer to Section 4.3.2 on the PAT and Section 4.7 on the Video Wizard Drop Down).

### 4.3.1 Content Button

The CONTENT Screen (shown in the figure below) enables the operator forward the received audio/video content to either a multicast address or to pass the entire transport stream directly to the LAN.

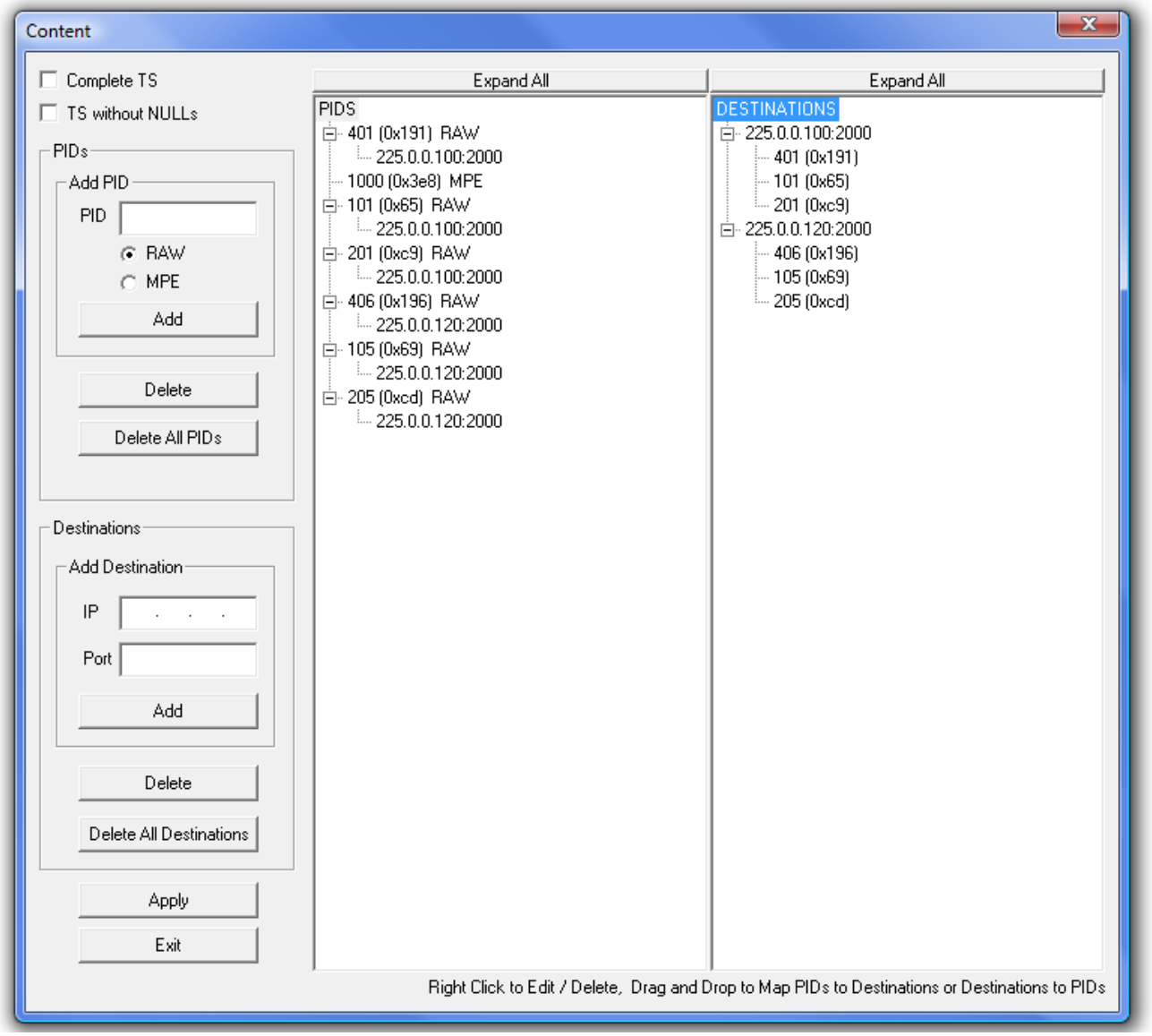



**Figure 10 - Video Content Screen**

1. COMPLETE TS: Selecting this checkbox will pass the complete transport stream to the LAN. Ensure a destination address is added to the destination list so that you know what mcast IP address the full transport stream is being sent to.

2. TS WITHOUT NULLS: Selecting this checkbox will pass the full transport stream less null packets to the LAN. Ensure a destination address is added to the destination list so that you know what mcast IP address the full transport stream is being sent to.
3. PIDS:
    a. ADD DESTINATION - PID: Use this edit box to add a new Program ID to the list; you can use decimal input or hexadecimal values preceded by "**0x**". You will be able to map PIDs to multiple multicast addresses. Using this feature, for example, a single video PID may be mapped to several different multicast addresses, each of which is mapped with a different language audio PID.

**NOTE:** - You can use the drag and drop feature to add PIDs to multicast addresses.

    b. RAW: Select this check box to add RAW MPEG (audio/video) PIDs to the PID List
    c. MPE: Select this check box to add an MPE date PID to the PID list

**NOTE:** - You can right click on a PID to edit the PID and change:

- An MPE PID to a RAW MPEG PID or
- From a RAW PID to an MPE PID.

    d. ADD: This button adds the content of the PID box to the PID list.
    e. DELETE: This button deletes the selected PID from the PID list.
    f. DELETE ALL PIDS: This button will empty the PID list.
4. DESTINATIONS: Destination IP Address may be added to the individual PIDs in the PID list. In this way, received PIDs are mapped to different multicast IP Address.
    a. ADD DESTINATION - IP: Use this edit box to add an IP address to the PID listed in the PIDs edit box above. You will be able to map PIDs to multiple multicast addresses. Using this feature, for example, a single video PID may be mapped to several different multicast addresses, each with a different language audio PID.
    b. ADD DESTINATION – PORT: Use this edit box to add a Port number to the IP Address

**NOTE:** - You can use the drag and drop feature to add multicast IP addresses to PIDs.

specified in Add Destination - IP.

    c. ADD: This button adds the content of the IP address and port boxes to the appropriate PID in the PID List.

d. DELETE: This button deletes the selected IP address and port number from the appropriate PID in the PID list.

e. DELETE ALL DESTINATIONS: This button will empty the IP destinations in the PID list.

5. APPLY: By pressing this button, PID and destination changes are sent to the receiver.
6. EXIT: Exits back to the main screen

> **NOTE:** - The keyboard may be used to add and remove PIDs. Also, right click on a list entry to edit or delete the PID list.

### 4.3.2 Program Association Table (PAT) Button

If your S200 receiver is the Pro model, then it has the ability generate a mini Program Association Table (PAT) for each program. The mini-PATs may be configured by selecting the PAT button. This brings up the Program Association Table screen (see below).

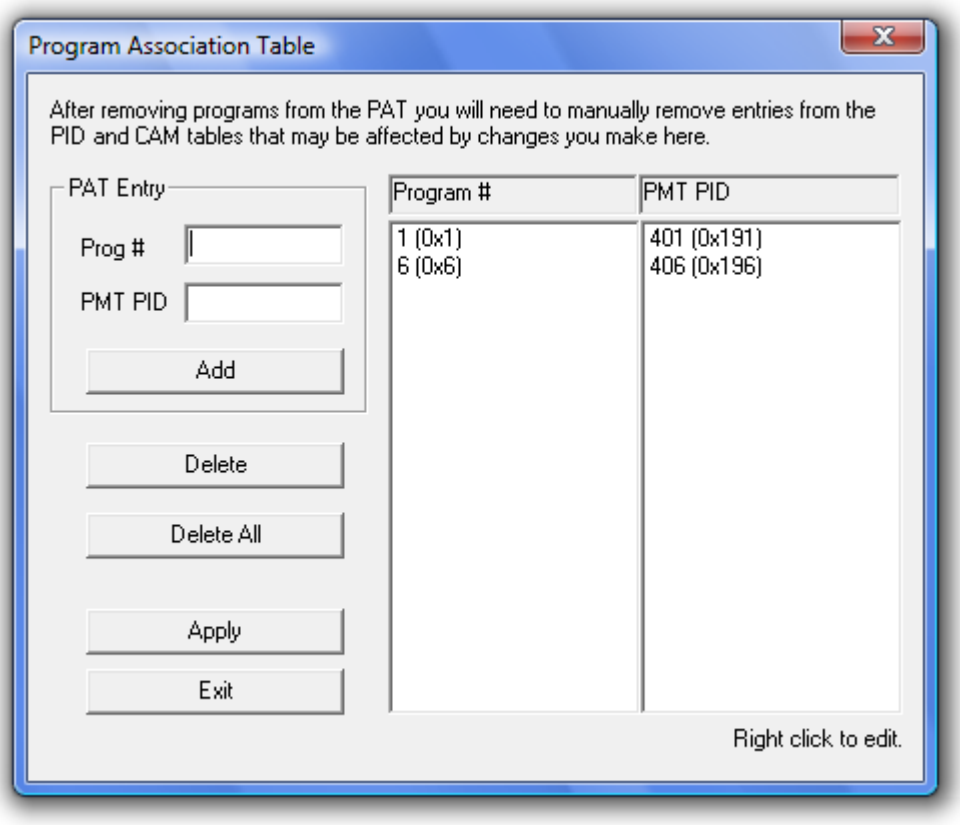



**Figure 11 - Program Association Table Screen**

1. **PAT ENTRY:** The S200 will generate a PAT based on the selected program number and the Program Mapping Table (PMT) PID.
    a. PROG #: Use this edit box to add a program number to the program number list
    b. PMT PID: Use this edit box to add the PMT PID for the appropriate program number in the PMT List
2. ADD: This button adds the content of the program number box and the PMT PID to the Program number/PMT PID list.
3. DELETE: This button deletes the selected program number and PMT PID from the Program number/PMT PID list.
4. DELETE ALL: This button will empty the Program number/PMT PID list.
5. APPLY: By pressing this button, the program number and PMT PID changes are be send to the receiver.
6. **EXIT:** Exits back to the main screen

## *4.4 Control*

The Control button group provides general configuration and control elements for the receiver.

### 4.4.1 Conditional Access Module (CAM) Button

The S200CA is equipped with a DVB Conditional Access Common Interface, which accepts a PCMCIA-based Conditional Access Module (CAM) and decryption smart card. This enables the S200CA to receive signals that are encrypted with many of the commercially available DVB Conditional Access Systems (CAS). Selecting the CAM button brings up the Conditional Access screen (as shown below). This screen enables the operator to add encrypted programs to the S200CA and instructs the S200CA which program(s) to descramble.

**NOTE:** If a consumer-grade CAM (single program stream) is used, only one program may be decrypted. This is a limitation of the CAM, not the S200CA. Professional CAMs may support more than 1 program stream.

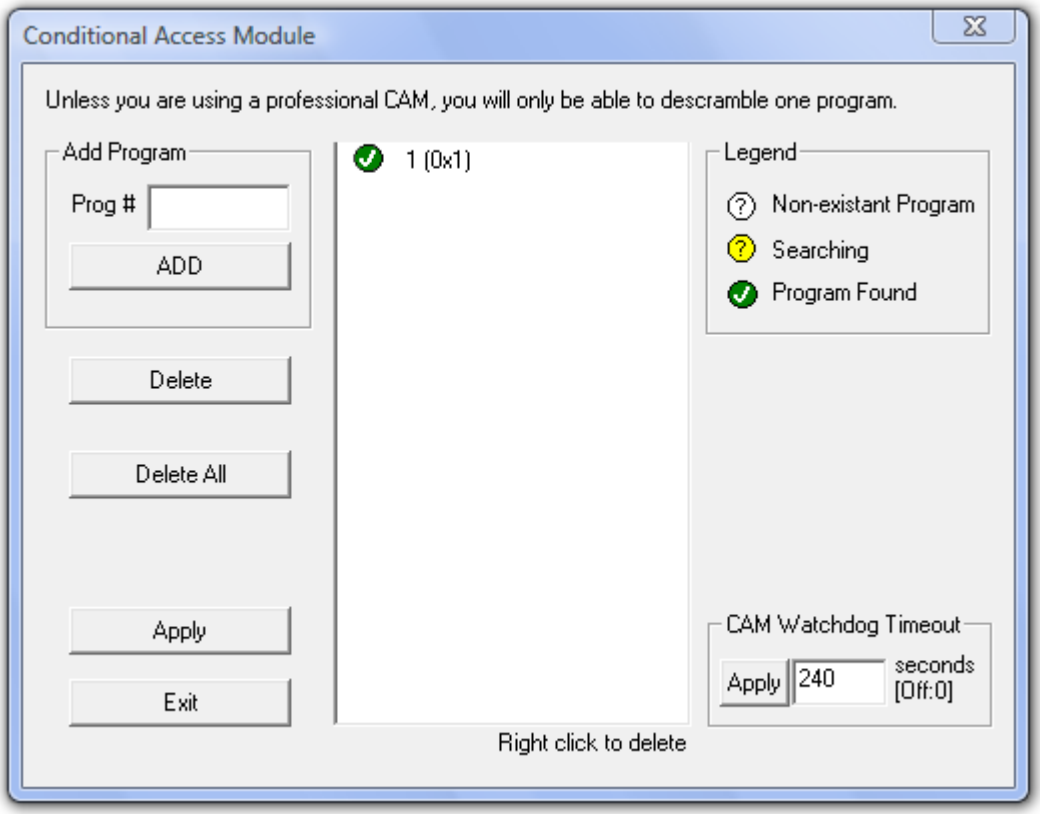



**Figure 12 – Conditional Access Screen**

1. PROG #: Use this edit box to add a program number to the program list.
2. ADD: This button adds the content of the program number box to the program list.
3. DELETE: This button deletes the selected program number from the program list.
4. DELETE ALL: This button will empty the Program list.
5. APPLY: By pressing this button, the program number changes are sent to the receiver.
6. EXIT: Exits back to the main screen
7. CAM WATCHDOG TIMEOUT: If the CAM you are using with the S200CA is initialized and receiving an authorized stream, but does not properly descramble the stream, then the S200 will automatically reset itself after the configured timeout interval has elapsed. This feature can be disabled by setting the Watchdog Timeout to 0 seconds.

### 4.4.2 Traps Button

This feature is not presently available on the S200

### 4.4.3 Reboot Button

Selecting this button will reboot the S200.

## 4.5 File Drop Down

The file drop down menu (shown below) provides access to the following features

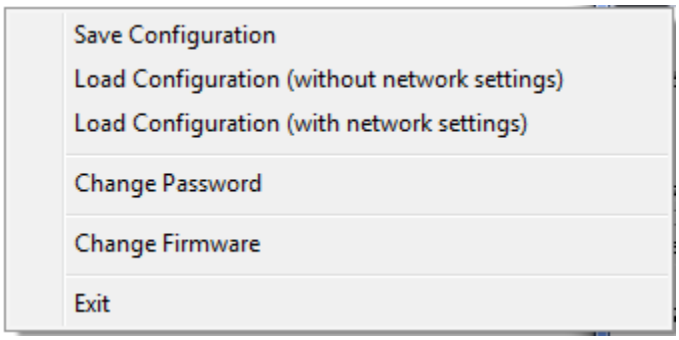



**Figure 13 - File Drop down Menu**

1. SAVE CONFIGURATION: Allows the user to save the S200 configuration settings to an XML file
2. LOAD CONFIGURATION (WITHOUT NETWORK SETTINGS): Allows the user to load the S200 configuration settings from an XML file. The network settings of the receiver will not be updated using this command.
3. LOAD CONFIGURATION (WITH NETWORK SETTINGS): Allows the user to load the S200 configuration settings from an XML file. Using this command, the S200 network settings (including the IP address) will be updated an applied to the S200.

**CAUTION:** Setting the IP address of the S200 to a non-routable address or an address not on the same subnet as the S200 Console PC may make the S200 unreachable from the S200 Console PC.

4. CHANGE PASSWORD: Allows the user to change the S200 Console program password.
5. EXIT: Exits the S200 Console program
6. CHANGE FIRMWARE: Allows the user to download a new firmware load for the S200 receiver.

**NOTE:** Before changing the firmware in your S200 receiver, you will need to change the IP address of your receiver to 192.168.0.x AND change the IP address of your configuration PC to the same subnet (192.168.0.y, where $y \neq x$ and $y \neq 1$). After completing the firmware upgrade, you can change your IP addresses back.

To change the S200 firmware, please refer to the figure below:

a. Select CODE FILE and browse to the S200 code update binary file.
b. Select COMMIT.
c. On the firmware upload is complete you should get a message stating the RECEIVER FIRMWARE HAS BEEN REWRITTEN. The S200 Console program will then shut down and must be restarted to continue configuring the S200.
d. If you get a CODE DOWNLOAD FAILED timeout error, ensure your have changed your IP addresses per the note above.

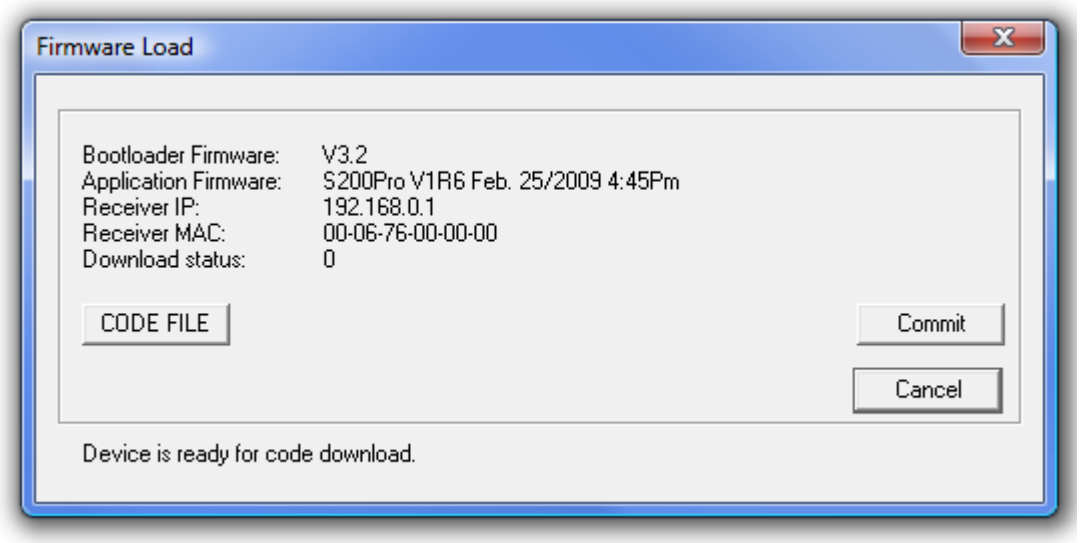



**Figure 14 - S200 Firmware Download Screen**

## 4.6 Control Drop Down

The Control drop down menu (shown in the figure below) provides access to the same functions as the buttons on the main application window with one exception – the IP Re-Mapping function. The IP Re-Mapping feature is described in detail in Section 5 below.

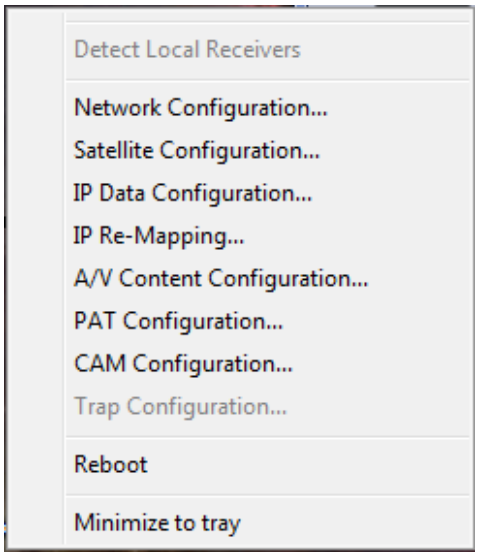



**Figure 15: Drop Down Menu (Control)**

## 4.7 Video Wizard Drop Down

The Video Wizard is designed to assist the operator in setting up audio/video programs for viewing. When the Video Wizard screen is filled out, the required MPEG PIDs needed to view a program (video, audio, PMT, and PAT) may be grouped together and assigned to a multicast IP address and port. Once submitted, the PID's and IP address will be used to populate the following receiver lists:

- Video Content List (PIDs and Multicast Address)
- PAT List (Program # and PMT PID)
- CAM program List (Program Number, if scrambled is selected)

**NOTE:** It is important to note that if a program is to be removed from the S200, that the individual PIDs, program number and multicast IP address must be manually removed from these lists.

The Video Wizard Screen below shows a typical configuration of a scrambled program (Program 1).

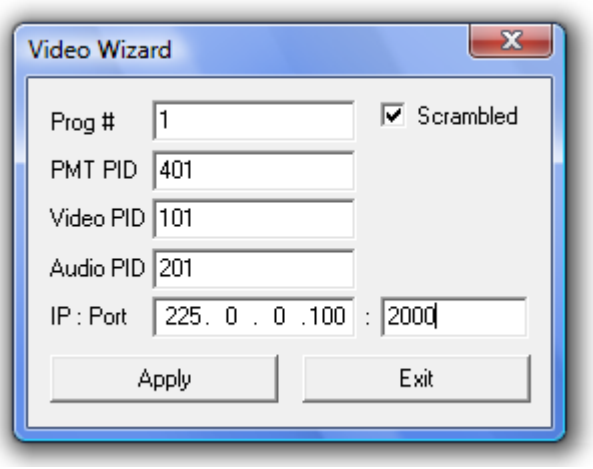



**Figure 16 –Video Wizard Drop Down (Scrambled Program)**

1. PROG #: Use this edit box to add the desired program number. This value will be used to help create a mini-PAT (see Section 4.3.2).
2. PMT PID: Use this button to add the Program Mapping Table (PMT) PID. This PID will be passed onto the LAN along with the other program PID's. It will also be used to help create a mini-PAT (see Section 4.3.2).
3. VIDEO PID: Use this edit box to add the video PID. This PID will be passed onto the LAN along with the program PIDs.

4. AUDIO PID: Use this edit box to add the audio PID. This PID will be passed onto the LAN along with the program PIDs.
5. SCRAMBLED: Check this radio button if the program is scrambled.
6. IP : PORT: Use this edit box to input the multicast IP address and port number
7. APPLY: By selecting this button, the above changes are applied to the S200.
8. EXIT: Exits back to the main screen

To configure a free-to-air program (or a non-scrambled program), the Video Wizard would be configured as shown below. Note the SCRAMBLED check box is not set. This means that no entry will be put in the Conditional Access Module (CAM) list and that the received program must NOT be scrambled.

**Figure 17 - Video Wizard Drop Down (Free to Air Program)**

## *4.8 Help Drop Down*

The Help drop down menu provides access to the Help menu and the About menu.

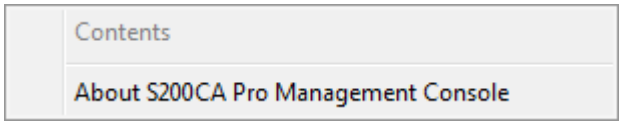



**Figure 18 - Help Drop Down Menu**

### 4.8.1.1 Help

The Help menu is not currently available.

### 4.8.1.2 About

An example of the About menu is shown below. It provides Novra contact information and the receiver hardware and software version numbers.

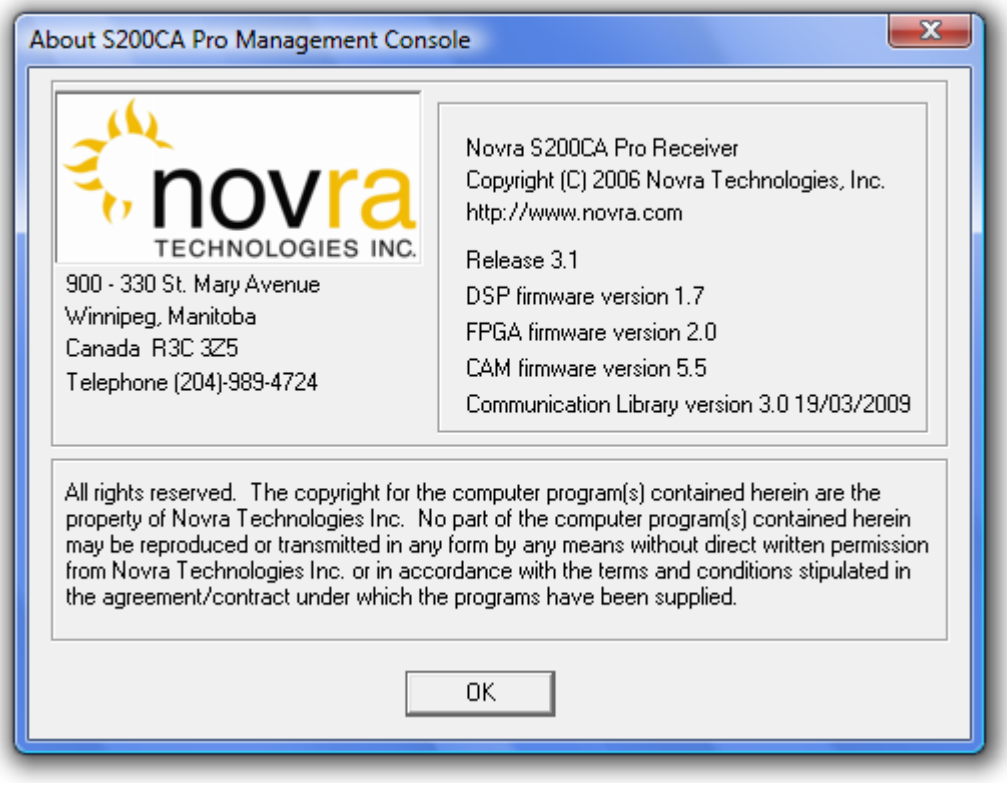

About S200CA Pro Management Console
novra
TECHNOLOGIES INC.
900 - 330 St. Mary Avenue
Winnipeg, Manitoba
Canada R3C 3Z5
Telephone (204)-989-4724
Novra S200CA Pro Receiver
Copyright (C) 2006 Novra Technologies, Inc.
http://www.novra.com
Release 3.1
DSP firmware version 1.7
FPGA firmware version 2.0
CAM firmware version 5.5
Communication Library version 3.0 19/03/2009
All rights reserved. The copyright for the computer program(s) contained herein are the property of Novra Technologies Inc. No part of the computer program(s) contained herein may be reproduced or transmitted in any form by any means without direct written permission from Novra Technologies Inc. or in accordance with the terms and conditions stipulated in the agreement/contract under which the programs have been supplied.
OK

**Figure 19 - About Screen**

# 5 IP Re-Mapping

This chapter discusses how to configure the IP Re-Mapping feature within the S200.

The IP Remapping feature in the S200 will enable the operator to re-map a multicast IP addresses or multiple multicast IP addresses that have been received by the receiver to a different destination multicast IP address. The IP mapping table will support up to 16 entries and will therefore allow for 16 multicast addresses to be remapped. Some of the features of the IP mapping table include:

- Ability to map single multicast IP address to a destination multicast IP address
- Ability to map multiple multicast IP addresses to a single destination multicast IP address,
- Ability to use a subnet mask to map a range of multicast IP address to a single destination multicast IP,
- Ability to turn the multicast mapping table on or off without losing the table contents,
- Ability to turn a single multicast mapping table entry off (No Rule) without losing the entry from the table,
- Ability to use IGMP filtering to enable (or disable) sending of mapped multicast packets, and
- Ability to forward mapped multicast IP packets regardless IGMP filter setting

## *5.1 Configuring the IP Mapping Table*

The IP mapping table can only be assessed from the main screen. Under the CONTROL button drop down menu (refer to Section 4.6) select the IP RE-MAPPING as shown in the Figure below.

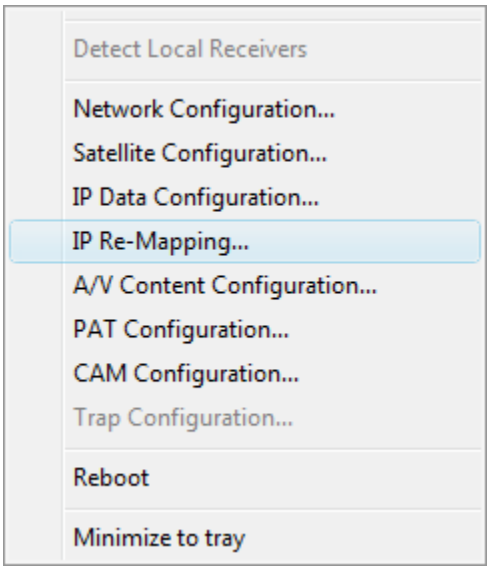



**Figure 20 - Selecting IP Re-Mapping**

This will bring up the IP re-mapping table as shown below.

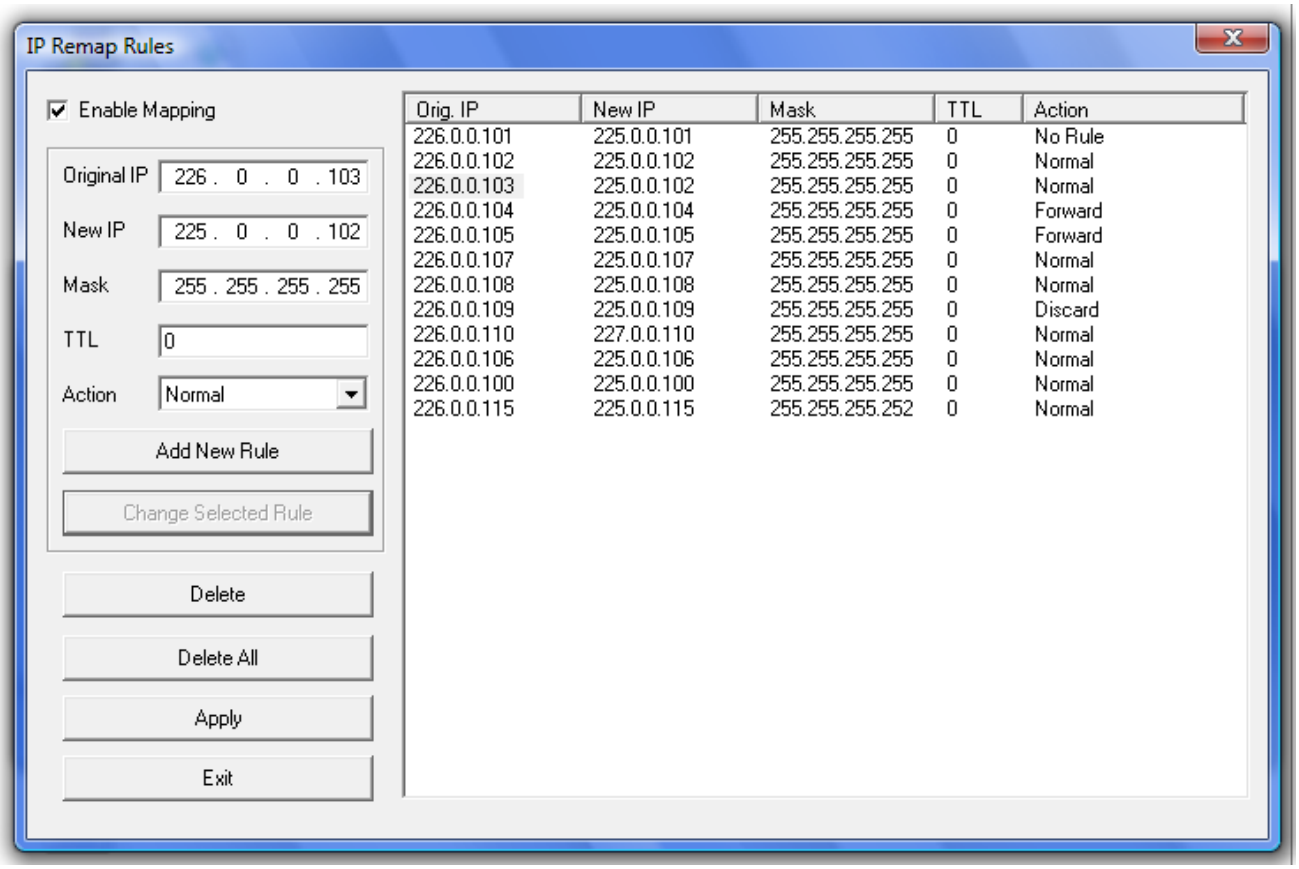



**Figure 21 - IP Remapping Table**

Referring to the Figure above, the left hand side of the screen enables you to configure the mapping rules and the right hand pane summarizes and displays the configured IP mapping rules. Up to 16 rules are supported.

The following is a description of the above screen entries:

1) ENABLE MAPPING: Check this box to enable the mapping table. Unchecking this box can also be used to disable the entire mapping table without losing the table contents. The table can then be re-enabled by checking the box.

**NOTE**: The ENABLE MAPPING box must be checked to use the IP Mapping feature

2) **ORIGINAL IP:** The original multicast IP address that is to be mapped to a new destination IP address. Note: This IP address must be a multicast IP address.

3) **NEW IP:** The destination multicast IP address that the original multicast IP address is mapped to. It is possible to map multiple Original IP addresses to a single New IP address. Note: this IP address must be a multicast IP address.

4) **MASK:** The subnet mask is applied to the Original IP address to create a range of IP address that is mapped to the new destination IP address.

5) **TTL:** Setting the Time To Live value to non-zero causes the TTL field in the IP header to be replaced with this value. The default setting is zero.

6) **ACTION:** The S200 shall perform the following packet forwarding options based on this value. The default setting is NO RULE.
   a) NO RULE - rule entry is not applied to the packet
   b) NORMAL - packet is forwarded based on the IGMP setting (see Note below)
   c) FORWARD - packet is always forwarded
   d) DISCARD - packet is always discarded

7) **ADD RULE:** Adds the rule as defined by the mapping table fields (entries 2-6 above) into the mapping table. Note: The mapping table fields may be populated by double clicking on a selected mapping table entry and may be then edited and added to the mapping table by clicking the Add Rule box.

8) **CHANGE SELECTED RULE:** The operator may load any rule into the mapping table fields (2-6 above) and edit any of the parameters as needed. Clicking the Change Selected Rule button will modify the selected rule with the edited updates.

9) **DELETE:** Will delete any selected entry in the mapping table

10) **DELETE ALL:** Will delete all entries in the mapping table

11) **APPLY:** Will apply the mapping table to the receiver. This box must be selected for the mapping table changes to take effect

12) **EXIT:** Will exit back to the S200 Configuration Application main screen

# 6 How to Configure the S200 for TV Viewing

This Section provides a step-by-step procedure for viewing TV programs using the S200-Pro or S200CA.

Prior to configuring the S200-Pro/S200CA for TV viewing, you will need to know on which PID's the TV program is being sent on. A typical TV program will contain 4 PID's, including:

- Video PID,
- Audio PID,
- Program Mapping Table (PMT) PID,
- Program Association Table (PAT) PID

The S200-Pro or S200CA will need to be configured to pass each of these PID's to the correct IP address on the LAN.

**NOTE:** Stream Analyzer programs for the PC, such as TSReader, may be used to help determine the PIDs in use for the video

Also, it should be pointed out that the S200 provides an Ethernet output (not a video output). It therefore cannot generally be connected directly to your TV. You can, however, pass the Ethernet signal to an MPEG-over-IP set top box (which would be used to drive video to your TV), or you can view the TV program(s) directly on your PC using a software video player, such as VLC.

To configure the S200-Pro or S200CA for watching TV, please do the following:

1. Configure the Novra software.
    a. Ensure the host PC is on the same IP address class as the S200-Pro or S200CA for configuration. This can be changed back after Novra receiver is configured (Refer to Section 4.1.14.1.1).
    b. Ensure the L-band frequency, symbol rate and LNB settings are correctly set and that the unit is locked to the satellite signal (see Section 4.1.2)
    c. Using TSReader or another stream analyzer, determine the PID's in use for video stream. This can be done by using the S200-Pro or S200CA to forward the entire Transport Stream to the LAN. To do this, go to the Video Content Screen (Refer to Section 4.3.1) and click on the COMPLETE TS radio button. You will also need to add the multicast IP address and port number that the stream will be sent to. In the Video Content Screen, you can expand the complete transport stream to see which multicast IP will be used (as shown in the Figure

below). Click Apply to apply the changes. Next run your stream analyzer and input the TS stream multicast IP address and port number into the program. You should now see a full description of all the PID's in the TS stream on your PC.

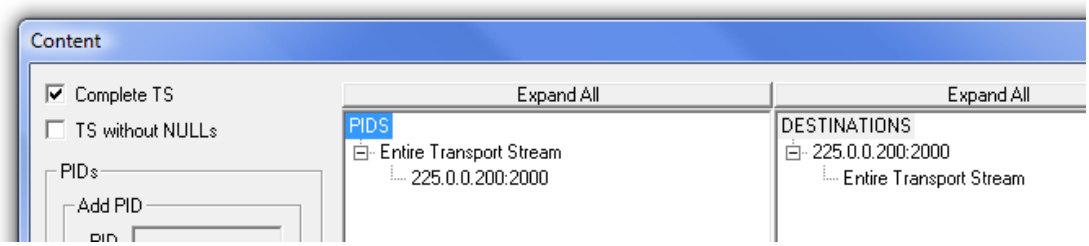



**Figure 22 - Passing the Complete TS to the LAN**

An example of 3 TV streams coming down the MPEG stream might be:

i. PAT – (usually PID 0)
ii. Video PID(s) - (i.e. 31, 41, and 51)
iii. Audio PID(s) - (i.e. 34, 44, and 54)
iv. PMT – could be, for example, the base number for the audio and video (i.e., 30, 40, and 50) where PID's 0, 30, 31, 34 would be one TV program, PID's 0, 40, 41, 44 would be another and PID's 0, 50, 51, 54 would be the third program.

2. Once you know your TV program PID's, you will need to configure the S200 to receive these PID's and pass them onto the player. In the Video Wizard pull down (Refer to Section 4.7 above), add the following items:
   a. The Program number you wish to view.
   b. If the program you are trying to receive is scrambled, select the scrambled box.

**NOTE:** To receive scrambled programs, you will need an S200CA with the appropriate Conditional Access Module (CAM) and an authorized smart card.

   c. The PMT, video and audio PID's.
   d. The destination multicast IP address and port number. Give each program stream you want to watch (group of 4 PID's) a unique IP address and port.

**NOTE:** You can make up the IP address based on knowing that no other multicast streams are using that address and port on your network. All multicast streams must be in the 224.X.X.X to 239.X.X.X address space. For example 224.0.0.10, port 3030.

3. Next you will need to manually create a PAT PID and copy it to the multicast address you just created. To do this, go to the Video Content Screen (Refer to Section 4.3.1) and do the following:

a. Add a RAW PID 0.
b. Mouse-over PID 0 and left to drag it under you multicast address you created above. You should now see the following PID's under your multicast address:
    i. PMT
    ii. Video
    iii. Audio
    iv. PAT
c. Apply the configuration change.

4. To set up VLC Media player to render the stream, perform the following:
    a. Select File, Open Network Stream.
    b. Click on the UDP/RTP radio button and enter the multicast address and port you specified in step 2 above in the appropriate areas. Select OK.
    c. VLC will then start playing the television programming.

# 7 Troubleshooting

This section can help you resolve most of the common problems when installing the S200.

**1) I connected the receiver and when I start the Console, it says it can't detect any S200 Receivers?**

- Make sure the unit is connected to the same LAN that your computer (running S200 Console) is connected to. The best way to rule that out is to use a cross over cable.
- Make sure the unit is powered up and the Ethernet link is established. The green LED on the back of the Ethernet connector should be on solid, and the yellow light should be blinking.
- If you are using a hub, make sure there is only one unit connected.

**2) I connected my unit, and it was auto detected. Every time I try to configure the device I get an error Message. What could be wrong?**

- Make sure the IP address assigned to the receiver is reachable from your PC, and the receiver is configured correctly to reach your machine (try pinging the receiver from your PC).

**3) Why won't the receiver lock to my settings?**

- Is the RF cable connected?
- Are you using the correct RF Settings (frequency and symbol rate)?
- Are you using the correct voltage/tone settings for the LNB?

**4) The receiver is locked to my signal and there is no Data, why?**

- Do you have the right PID selected?
- Are you sure you are on the right transponder?
- If the Ethernet transmitted packet counter is counting up, where is that traffic going?
- Is the default gateway on the receiver set correctly?
- Does the DVB MAC address of the traffic match the Mac address of your unit? (UNICAST)
- Are you using IGMP and the network clients are not subscribing? (multicast)
- Is the IGMP hardware filtering checked off (in the Network tab), but no network clients subscribing with IGMP join requests.

**5) I have created a mapping rule, but the packets don't seem to be mapped. I only see the original IP packets when I sniff the LAN.**

- Make sure you have enabled the Mapping table,
- Make sure your mapping action rule is NORMAL or FORWARD,

6) **I have created a mapping rule, but the packets don't seem to be mapped. I don't see either the Original IP packets or the New IP packets when I sniff the LAN.**

- Make sure your mapping action rule is NORMAL or FORWARD,
- If your mapping action is NORMAL and you have IGMP filtering enabled, make sure you have an application running that will generate an IGMP join to receive the packets. Otherwise you could try to turn IGMP filtering off, or set your mapping action rule to FORWARD. Note: if you set your mapping action rule to NO RULE, the Original IP packets will not get mapped and the IP traffic on your LAN will be your Original IP packets (as per 1 above)

7) **I am trying to update the firmware, but I keep getting a CODE DOWNLOAD FAILED timeout error?**

- Try changing the IP address of your receiver to 192.168.0.x and change the IP address of your configuration PC to the same subnet, such as 192.168.0.100. Do not use 192.168.0.1 or the same IP address as your S200.

# 8 Specifications

## *8.1 Receiver Characteristics*

**RF Tuner**

- Receiving Frequency: 950 to 2150 MHz
- Frequency Acquisition: ± 50% Symbol Rate up to ±10 MHz
- Input Signal Level: -70 dBm to -25 dBm

**Multi-standard Demodulation**

- DVB-S
  - QPSK: 1.0 to 45 Msps (auto selection)
- DVB-S2
  - QPSK: 1-45 Msps (auto selection)
  - 8PSK: 1-30 Msps (auto selection)
- Data Rate: 72 Mbps
- Nyquist Root Filter: 0.2, 0.25, 0.35 rolloff

**Multi-Standard Decoding FEC (Forward Error Correction)**

- DVB-S
  - Viterbi 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 puncture rates
  - Reed Soliman 16 bit decoder
- DVB-S2
  - LDPC 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 rates
  - BCH (Bose-Chaudhuri-Hocquenghem) decoder

**LNB Power and Control**

- LNB Supply Voltage: Selectable 13/18V, 11/15V, 20 V or off
- LNB Supply with selectable long line compensation
- LNB Control: Selectable 22 KHz, 44 KHz or off
- LNB Supply Current: 400 mA with Short Circuit and Surge Protection

**Status Indicators**

- Power: Red LED
- Lock: Green LED
- Data: Blue LED (will blink every ½ second if traffic is flowing)
- Ethernet Link (green) and Transmit (yellow)

**Hardware Capabilities**

- Multiprotocol Encapsulation (MPE)
- PID Filters: 32
- Internal Hardware Watchdog
- Non-Volatile Configuration Storage
- Field upgradeable operating system for new s/w releases and functional upgrades

**Operating Systems**

- Once Configured, Receiver Supports all Operating System

**Physical Interfaces**

- RF Input Connector: F-Type, 75 ohms
- Ethernet 100 Base-T LAN Interface: RJ-45

**CAUTION:** Nothing should be inserted between the S200 and the satellite dish except for a surge suppressor. Cable TV Splitters, TVs, VCRs, and FM receivers are not designed for connection to this portion of the network. They will not work and if they are connected, even for a brief moment, they will probably never work again because the power on the coax will destroy the input of the misplaced unit.

## 8.2 Minimum System Requirements

Your computer must operate with any one of the following operating systems to successfully use the Novra S200 Receiver:

- Windows 2000, with Service Pack 4
- Windows XP
- Windows Vista

Your computer must have **at least** the following:

- Processor: Pentium 566 MHz
- RAM: 32 MB
- Free disk space: 40 MB
- Video: card and driver that support 256 or more colors
- CD drive (required for software installation only)
- Ethernet network interface card (NIC): 100 Mbps (100 BaseT)

**NOTE**: - The receiver **may** work with system parameters below those specified but performance will be lacking.

**NOTE:** - Performance will be dependant on other applications that your PC is running.

## 8.3 Supplied Equipment

Please confirm you have received all the equipment listed below.

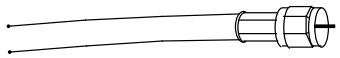
- Novra S200 Receiver
- Cross-over cable or Ethernet cable
- Power supply (120 Vac to 24 Vdc North America; **OR** 220 Vac to 24 Vdc European)
- S200 Receiver Software CD
- Novra S200 Receiver User Manual (Soft Copy on CD)

# APPENDIX

## Terms, Definitions, and Other Tidbits of Information

**Crossover Cable** A crossover cable is a cable that is used to connect two computers by reversing, or crossing over, the cable pin contacts. This eliminates the need to use a hub when connecting two PCs. It is also referred to as a "Null Modem" cable.

**Coax Cable** Looks like this:



The coaxial cable is most commonly used for Cable TV feeds inside a house or apartment. This form of cable allows the high frequencies of TV, and Satellite type signals to move from one place to another with a minimal amount signal loss.

**DVB** Digital Video Broadcasting (DVB) is a set of standards that define digital broadcasting using satellite, cable, and terrestrial infrastructures.

**FEC** Forward Error Correction (FEC) is a system of error control for data transmission where the receiving device can detect and correct certain errors.

**Feed Horn** This is the device that receives the focuses signals from a satellite dish. It collects these signals and submits them to the next piece of equipment in the network, usually a Low Noise Block converter which then changes the signals into a better format for transpiration to the receiver.

**Geostationary Orbit** The position where a satellite is 35,786 kilometers (22,241 miles) above the equator. At this distance, the satellite Orbits the earth at the same rate as the earth is turning. This causes the satellite to appear stationary in relation to an observer on the ground.

**IP** The Internet Protocol (IP) is a network communication protocol used on Ethernet networks and the Internet.

**IP Address** The 32-bit computer address defined by the Internet Protocol. It is usually represented in dotted decimal notation. Example: 192.168.111.112

**L-Band** This range of frequencies is from 950 MHz to 2,150 Mhz It is much lower than those used by satellites (About 1/10 to 1/6). Satellite frequencies travel well through space and our atmosphere but do not do well through the cable that comes from the dish on the roof to the receiver. So LNBs convert satellite frequencies to the lower, easier to transport, band of frequencies referred to as the L-Band. It is L-Band frequencies that the S200 receiver tunes to.

**LNA** Older systems used a unit called an LNA Low Noise Amplifier. This unit amplifies the RF frequency and then transmits the signals down a special (expensive) cable to the receiver. Note that received signals are not converted to lower frequencies by this unit.

**LNB** LNB stands for a Low Noise Block-converter. This unit receives the signals collected from a satellite and converts their very high frequencies (12 Giga Hertz, written 12 GHz, which is actually 12,000,000,000 cycles per second) to a lower and somewhat more usable range. All LNBs have a Local Oscillator (LO). This number is usually stamped on the LNB but not always. It may be necessary to check the original

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|---|---|
| | specifications that came with the LNB or use the model number and brand name to search the Internet. |
| **LNBF** | LNBF stands for a Low Noise Block-converter and Feed horn. This is quite a common arrangement where the Feed Horn focal point that collects reflected signals from the satellite dish is combined with the low noise block-converter into one package. |
| **LO** | The Local Oscillator (LO) is a circuit that creates a tone of a very specific frequency. These units have many applications in electronics. This important thing to remember is that there is an LO in the LNB (Low Noise Block-converter) and it is part of the circuit that converts the received satellite RF Frequencies to the more user friendly L-Band Frequencies. Typical values include 9.75, 10.60, 10.75, 11.00 and 11.25 GHz for the Ku band and 5.15 GHz for the C Band of satellite frequencies. |
| **MAC Address** | The Media Access Control (MAC) address is the unique hardware address for any piece of electronic equipment attached to a network. The MAC Address for your Novra S200 Receiver is displayed on a sticker on the bottom of the receiver. |
| **Mbps** | Mega bits per second. (Million bits per second) |
| **MBps** | Mega Bytes per second. One "Byte" in computer terms is the same as 8 bits. It is often referred to as a word.<br><br>1 Mbps = 8 Mbps = 1 million Bytes (Words) per second = 8 million bits per second. |
| **Msps** | Mega symbols per second. Suppose you have four symbols, call them A, B, C & D. Let the Symbol A represent two bits of data with the value 00.<br><br>Let B represent two bits of data with the value 01<br>Let C represent two bits of data with the value 10<br>Let D represent two bits of data with the value 11<br><br>This means that if the signals we are interested in consist of 1.0 Msps (That's 1 Million symbols per second), and each symbol represents two bits of data, then our signal has a data rate of 2.0 million bits per second (2.0 Mbps).<br>The important point to remember is that satellite systems send and receive symbols which are then converted into data. The S200 takes the resulting data and forwards it to your computer in bursts called "packets." |
| **Packet** | A packet is the unit of data that is routed between an origin and a destination. When any file is sent from one place to another (the Internet as an example) it is divided into "chunks" of an efficient size for routing. Each of these packets is separately numbered and includes the Internet address of the destination. |
| **PID** | The Packet Identification Code (PID) is used by the receiver to sift through the different packets of the transport stream. The transport stream contains data representing many different signals. The S200 software running on your PC uses the PID number to find only those packets of data that contain the information you have requested. (See RF Frequency.) |
| **Polarization, Circular** (Right / Left) | In layman's terms, a circularly polarized signal corkscrews towards the earth. Unlike linear polarization (described below), where the signal is fixed in an up and down fashion or a side to side fashion, Circular Polarization causes the signal to rotate. If it were possible to actually see the incoming signal, it would rotate like the hands on a clock. As with Linear Polarization, this has two modes of operation. It can |

either rotate in a clock wise fashion or counter clockwise. Polarization is very useful because it allows the frequency of a Right polarized signal to overlap with the same frequencies of a Left polarized signal.

**Polarization, Linear** (Horizontal/Vertical) — In layman's terms, a linearly polarized signal from a satellite approaches the earth as a wave that goes up and down like the waves on the ocean, or from side to side. These two types of waves are classified as being vertically or horizontally polarized. Polarization is very useful because it allows the frequency of a vertically polarized signal to overlap with the same frequencies of a Horizontally polarized signal.

**RAM** — Random access memory. Used for short term storage of information requiring quick access on a computer. Information stored in RAM can be accessed by the computer much faster than information on the Hard Drive can be accessed.

**RF Frequency** — Each satellite in orbit has several channels that it can use, each with its own RF Frequency. (Each channel is often referred to as a transponder.) The easiest way to understand them is to think of your FM radio. There are many channels on the FM dial that one can choose from. ("*99.9 FM, All Rock, All the Time*") When you input the station number to your FM receiver you are actually telling it what RF Frequency it should look at. (99.9 FM means that 99.9 Mega Hz is the desired frequency.) But unlike the FM radio where the channel you tune to only contains one stream of music, a satellite channel contains many individual signals. One channel can contain Internet data **and** video **and** audio **and** specialized data in any number of permutations and combinations. The S200 uses the PID numbers that come with each Internet data, video, audio and specialized data signal to separate them all. (See PID.)

**Satellite Signal Hierarchy**

1 Satellite has -
|
10 - 24 Transponders (Channels) each with
|
dozens of distinct RF Frequencies each containing
|
up to a theoretical maximum of 8190 packet streams identified by their individual PIDs.

**Subnet** — A portion of a network, which may be a physically independent network segment, and which shares a network address with other portions of the network.

**Symbol Rate** — See Msps

**Transponder** — This is the unit on the satellite that receives a signal transmitted from the earth station, amplifies it, changes its frequency and retransmits it back down to earth. Each radio channel has its own transponder and a number of transponders on the satellite are used to cover the allocated frequency band. A typical satellite will have 24 transponders.

**Viterbi** — "Convolutional encoding with Viterbi decoding is a Forward Error Correction technique that is particularly suited to a channel in which the transmitted signal is corrupted mainly by additive white Gaussian noise." Further information can be found by searching the Internet or looking at any of these sites.
http://pw1.netcom.com/~chip.f/Viterbi.html
http://hissa.nist.gov/dads/HTML/viterbiAlgorithm.html